RESEARCH ARTICLE

Local preferences of ethnobotanical species in the Indian Himalaya: Implications for environmental conservation

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The preferences of local communities on the importance of various groups of ethnobotanical species were examined in the Indian Himalayan State of Uttarakhand in order to select key species for development of the society and environmental conservation. The results indicated that the preferences of local people varied across different ethnobotanical groups of species. A total 32 medicinal, 16 horticultural, 22 fodder and 20 timber-yielding plant species were selected as the most preferred by the local people of Uttarakhand. Twelve species of medicinal plants preferred by the local people were rare and endangered, and one was near-threatened. There were regional variations in the selection of preferred ethnobotanical species by the local people due to the availability of different and diverse floristic compositions around their settlements.

Keywords: Conservation, development, ethnobotanical species, local preferences.

THE Himalaya harbours a rich diversity of ethnobotanical species, which generate considerable benefits from social and economic perspectives. However, the ongoing management strategies and traditional values of ethnobotanical species are difficult to reconcile with the acute conflicts between the local people and foresters[1]. Apart from preserving the notified natural areas, the Forest Department in each state is also responsible for afforestation; hence millions of plantlets are planted annually. However, the local people are hardly involved in the selection process of planting materials. Ignoring the perceptions of the local people in the beginning of the planning phase, which includes the selection of planting species for afforestation, is one of the major impediments for the successful implementation of such schemes[2]. Instead of cooperating, the local people deliberately damage the plantations for several reasons, including (i) restrictions on economic benefits from timber to the local people, (ii) complete ban on collection of many valuable medicinal plant species, (iii) fear of notification of community land into government forest land, and (iv) plantation of industrially valued conifers by government agencies, contrary to people's preferences of other multipurpose species.

There are many important sectors in developing the ethnobotany, such as cultivation of medicinal, horticultural, timber-yielding plant species for commercial use as well as for maintaining their healthy population and reducing pressure on the wild stock[3–5]. Proper selection of suitable species among the large number of ethnobotanically important species is a prerequisite for their successful plantations. This study aims at understanding the preferences of local people towards the important ethnobotancial species in order to find out the more acceptable plant species for re-vegetation of the degraded lands. Selection of key species with the participation of the local people for afforestation is considered to mitigate the conflicts and help in environmental conservation.

The present study was carried out in one of the Himalayan States, namely Uttarakhand (28°43′–31°8′N and 77°35′–81°2′E). It comprises 13 districts and spans over an area of 53,485 sq. km, with elevation ranges from 210 to 7817 m. Some of the key characteristics of the state are summarized in Table 1. Three hill districts, namely Pithoragarh, Chamoli and Pauri were selected for the present study, realizing that mountain people depend more on forest and forest produce than residents of the lowland and plains of India; hence they have a great deal of ethnobotanical knowledge. Each district selected for the present study has a different cultural, social, altitudinal, vegetational and environmental set-up. Among the various ethnobotanical groups of species, four major groups were selected for understanding the preferences of the local people, which have been used for cultivation in and around the village surroundings by both Government and non-government organizations. The ethnobotanical groups include the medicinal, horticultural, fodder and timber-yielding plant species.

Structured questionnaire surveys were conducted from 2003 to 2005 in the villages of all three hill districts. Ten villages in each district were approached and minimum ten households in each village were surveyed intensively. An attempt was made to interview the male or female head of every household; or the elder person of a family. Other members of the household were also present, in many cases during the interview, to clarify the points

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Table 1. Characteristics of districts studied in Uttarakhand

Parameters	Pauri	Chamoli	Pithoragarh
Total population	697,078	370,359	462,289
Rural	607,203	319,656	402,456
Urban	89,875	50,703	59,833
Schedule caste	106,653	67,539	106,449
Schedule tribe	1594	10,484	10,279
Bhotia	214	10,192	18,647
Boksha	1202	7	7
Tharu	7	9	39
Jaunsari	83	21	7
Raji	17	0	364
Altitudinal range (study villages; in m)	700–1800	1500–2500	1800–3000
Major vegetation type	Subtropical, temperate	Subtropical, temperate, alpine	Temperate, alpine
Major forest type	Sal forest, sal-mixed forest, pine forest, pine–oak forest, oak forest	Pine forest, pine–oak forest, oak forest	Pine forest, pine–oak forest, oak forest
Forest cover (%)	61.38	33.60	29.29
Wasteland (%)	4.50	19.60	4.22
Pasture land (%)	5.69	2.59	13.26
Tree crops and groves land (%)	8.09	4.20	7.18
Fallow land (%)	2.36	0.20	2.23
Agriculture + agroforestry land (%)	11.82	5.37	10.03
Change in agriculture + agro-forestry land after 1974 (%)	–14.44	–3.51	–7.09

Source: Refs 19–22.

made by the main respondent. Each respondent was asked to select and prioritize five important ethnobotanical species from each of the four groups of ethnobotanical species such as (1) medicinal, (2) horticultural, (3) fodder and (4) timber-yielding plant species. In this approach, the informants themselves had valued the significance of plant species.

In case of medicinal plant species, the respondents were also asked about the plant parts used and the local uses of medicinal plant species selected by them as the priority species. This way the second round of interview was open-ended, in which the other members of the family had helped in cross-checking the data on indigenous uses of medicinal plant species. During the open-ended interviews, the local people disclosed conflicts with the Forest Department on the use and management of various ethnobotanical species. In order to verify the identity of plant species mentioned by the respondents, field visits were undertaken with the respondents or any other person of his family who is aware about the concerned species. The collected plant specimens were again verified with the respondents who had mentioned the species as a preferred one. Information on various ethnobotanical species was analysed for the frequency of importance. The forest officials were contacted to discuss the plantation programmes of various ethnobotanical species and their management conflicts with local people. Besides, the Forest Management Plans were examined in order to find out the ethnobotanical species proposed for plantations, and the management and conservation strategies adopted by the Forest Department.

Results and discussion

Local preferences of medicinal plants

The findings of this study indicate that the local people of Uttarakhand had a number of choices in the case of medicinal plant species, whereas in other groups of ethnobotanical species they had relatively less number of choices. Except for the responses on medicinal plants by the local people of Chamoli district, the first species in each ethnobotanical group was preferred by >90% of the respondents. The homogenous responses of the local people of Chamoli district about the importance of medicinal plants indicate that knowledge on medicinal plants is more or less uniformly distributed among the local people and it is a common knowledge. The survey regarding preferences on medicinal plants by the inhabitants of Chamoli may therefore need few informants to generate reliable results. Similar observations have been made on the edible plant species used by the villagers of Gourounsi in Burkina Faso[6]. Three endangered species, *Swertia chiraiyta*, *Picrorhiza kurrooa* and *Aconitum heterophyllum*, were also considered important medicinal plants due to their reliable therapeutic efficacy (Table 2). There were many species of *Swertia* (e.g. *S. angustifolia*, *S. chiraiyta*,

Table 2. Indigenous use, plant part used, rarity status and preference of local people on the importance of various medicinal plant species in the three hill districts of Uttarakhand

Local, Latin name of medicinal plant species	Part used	Major indigenous use	Rarity status in Uttarakhand	Preference of local people (in %)		
				Pauri	Chamoli	Pithoragarh
Chiraita, *Swertia chiraiyta* (Roxb. Ex Fleming) Karsten	Leaf, stem	Malarial fever	EN	92	48	42
Awala, *Phyllanthus emblica* L.	Fruit, bark	Blood purifier, throat ache	–	92	45	–
Katuki, *Picrorhiza kurrooa* Benth.	Stem	Fever, blood purification	CR EN	–	42	80
Ateesh, *A. heterophyllum* Wall.	Root	Tonic, diarrhoea, aphrodisiac	CR EN	–	41	95
Tulsi, *Ocimum sanctum* L.	Leaf	Bronchitis, constipation	–	58	33	14
Salampanja, *Dactylorhiza hatagirea*. (Don) Soo.	Tuber	Tonic, kidney complaints	CR EN	–	27	50
Timur, *Zanthoxylum armatum* DC.	Fruit	Toothache	VU	–	25	32
Haldi, *Curcuma domestica* Valeton	Rhizome	Blood purifier, digestive disorder	–	16	22	–
Tejpat, *Cinnamomum tamala* Nees	Bark, leaf	Heart and throat complaints	VU	–	22	–
Dolu, *Rheum australe* Don	Root	Internal pain	EN	–	16	20
Lahsun, *Allium sativum* L.	Bulb	Blood and digestive disorders	–	–	16	–
Kut, *Saussurea costus* (Falc.) Lipsch.	Root	Dysentery, ulcer, stomach ache	CR EN	–	13	43
Adrak, *Zingiber officinale* Roscoe	Rhizome	Headache, toothache, cough	–	8	12	–
Choru, *Angelica glauca* Edgew.	Root	Gastric complaints	EN	–	12	15
Geranium sp.	Leaf	Skin disease	–	–	11	–
Brahmakamal, *Saussurea obvallata* (DC.) Edgew.	Flower bud	Reproductive disorder	EN	–	7	–
Buransh, *Rhododendron arboreum* Smith	Bark	Digestive and respiratory disorders	–	–	6	7
Pashanved, *Bergenia stracheyi* (Hk. f. & Th.) Engler	Root, flower	Blisters	NT	–	6	9
Devdar, *Cedrus deodara* (Roxb.) Loud.	Stem	Ulcer, rheumatic pain	–	–	2	–
Thuner, *Taxus baccata* L.	Bark	Tumours, cancer	EN	–	–	18
Bankakdi, *Podophyllum hexandrum* Royle	Fruit	Cough	EN	–	–	12
Banj, *Quercus leucho-trichophora* A. Camus	Seed	Scabies, urinary disorder	–	–	–	2
Kharshu, *Quercus semecarpifolia* Smith	Seed	Scabies	–	–	–	3
Pangar, *Aesculus indica* (Colebr. Ex Camb.) Hk.	Root, bark	Rheumatic pain	–	–	–	6
Kingod, *Berberis asiatica* Roxb. ex DC.	Root	Eye diseases	–	67	–	–
Karonda, *Carissa opeca* Stapf.	Leaf, root	Fever	–	67	–	–
Brahmi, *Centella asiatica* (L.) Urban	Leaf	Blood purifier, liver complaints	–	25	–	–
Neem, *Azadirachta indica* A.H.L. Juss.	Leaf, bark	Diarrhoea, antibiotic, toothache	–	25	–	–
Akhrot, *Juglans regia* L.	Bark	Toothache	–	16	–	–
Daikan, *Melia azedarach* L.	Fruit, leaf	Antiseptic	–	8	–	–
Hardi, *Terminalia chebula* Retz.	Fruit, seed	Cough, gastritis	–	8	–	–
Ganna, *Sacharum officinarum* L.	Stem juice	Constipation	–	8	–	–

CR EN, Critically endangered; EN, Endangered; VU, Vulnerable; NT, Near-threatened.

S. incana) in different localities within the study area and the local people used most of them in curing malarial fever. All three species of *Swertia* were known to the local people by common name 'chirayta'. However, *S. chiraiyta* was considered the most potential and effective herbal medi-cine for malarial fever. Many locally preferred medicinal plant species were also used as regular spices by the local people. *Zanthoxylum armatum*, *Curcuma domestica*, *Cinnamomum tamala*, *Zingiber officinale*, *Allium sativum* and *Angelica glauca* were the preferred medicinal plant species, which were used as a spice. Among these six species, three were threatened and none of them was cultivated in the study villages and collected from the wild for domestic and commercial purposes.

Among the total medicinal plant species preferred by the local people of Uttarakhand, 12 were threatened and one species was near-threatened (Table 2). The pressure on the survival of these threatened species has increased manyfold due to their low population size, over exploitation from the wild[3,7], and preferences of the local people. The pressure has increased on such threatened species with increase in the preferences for various ethnobotanical uses. For example, *Taxus baccata* and *Cedrus deodara* were preferred for medicinal use as well as for timber. The bark of *T. baccata* was also used in local tea by the Bhotiya tribal community of Chamoli and Pithoragarh. *Saussurea obvallata* was one of the preferred medicinal plant species, which was highly exploited as offerings to the local deity by the local people of Chamoli and Pithoragarh. Although there are provisions to check the illicit collection of rare and endangered plant species from the wild, this does not stop the continued illicit har-

Table 3. Preferences of local people on the importance of various horticultural, fodder and timber-yielding plant species in the three districts of Uttarakhand

	Preference of local people (in %)		
	Pauri	Chamoli	Pithoragarh
Local, Latin name of horticultural plant species			
Seb, *Pyrus malus* L.	25	91	85
Aaru, *Prunus persica* (L.) Batsch	16	59	90
Nashpati, *Pyrus communis* L.	16	52	–
Malta, *Citrus sinensis* (L.) Osbeck	75	50	22
Poolam, *Pyrus* sp.	–	50	50
Narangi, *Citrus reticulata* Blanco	16	44	34
Khumani, *Prunus armeniaca* L.	16	38	26
Amrood, *Psidium guajava* L.	92	25	13
Anar, *Punica granatum* L.	25	24	–
Angoor, *Vitis vinifera* L.	–	16	–
Akhrot, *Juglans regia* L.	25	12	32
Kela, *Musa* sp.	25	–	53
Neebu, *Citrus limon* (L.) Burm. f.	–	–	45
Aam, *Mangifera indica* L.	83	–	–
Papita, *Carica papaya* L.	25	–	–
Awala, *Phyllanthus emblica* L.	16	–	–
Fodder plant species			
Banj, *Quercus leucho-trichophora* A. Camus	16	98	100
Telonj/Timshu, *Quercus floribunda* Lind.	–	50	60
Bheemal, *Grevia oppositifolia* Buch.-Ham. ex D. Don	92	41	12
Faliyat, *Quercus glauca* Thunb.	–	41	–
Khareek, *Celtis australis* L.	92	33	31
Timla, *Ficus auriculata* Lour.	–	33	9
Kharshu, *Quercus semecarpifolia* Smith	–	16	100
Quiral, *Bauhinia purpurea* L.	22	8	–
Semal, *Bombax ceiba* L.	–	8	–
Kanei, *Ilex dipyrena* Wall.	–	–	11
Ringal, *Arundinaria falcata* Nees	8	–	53
Syan, *Populus ciliata* Wall.	–	–	11
Khamiya, *Acer cappadocicum* Gleditsch	–	–	10
Dhiyar, *Eurya acuminata* DC.	–	–	10
Tusiyar, *Debregeasia longiflolia* (Burm. f.) Wedd.	–	–	9
Chamlai, *Desmodium elegans* DC.	–	–	9
Jumya/Jhumra, *Chimonobambusa jaunsarensis* Gamble	–	–	7
Malu/Siali, *Bauhinia vahlii* (Wt. & Arn.) Benth.	–	–	6
Nyaphla, *Pyrus vestita* Wall. ex Hk. f.	–	–	4
Daikan, *Melia azedarach* L.	83	–	–
Tun, *Toona serrata* (Royle) M. Roemer	50	–	–
Dhaula, *Woodfordia fruticosa* (L.) Kurz.	33	–	–
Timber-yielding plant species			
Chir, *Pinus roxburghii* Sarg.	67	100	–
Devdar, *Cedrus deodara* G. Don	65	91	60
Tun, *Toona serrata* (Royle) M. Roemer	75	58	19
Banj, *Quercus leucho-trichophora* A. Camus	16	33	–
Raga, *Abies pindrow* Royle	–	32	41
Telonj, *Quercus floribunda* Lind.	–	25	–
Faliyat, *Quercus glauca* Thunb.	–	16	–
Akhrot, *Juglans regia* L.	25	8	30
Kharshu, *Quercus semecarpifolia* Smith	–	8	–
Uteesh, *Alnus nepalensis* D. Don	–	8	38
Surayin, *Cupressus torulosa* D. Don	–	–	100
Thuner, *Taxus baccata* L.	–	–	80
Panyyan, *Prunus cerasoides* D. Don	–	–	10
Pangar, *Aesculus indica* (Colebr. ex Camb.) Hk.	–	–	7
Sheesam, *Dalbergia sissoo* Roxb.	92	–	–
Sal, *Shorea robusta* Gaertn. f.	64	–	–
Sagon, *Tectona grandis* L.	60	–	–
Daikan, *Melia azedarach* L.	18	–	–
Aam, *Mangifera indica* L.	16	–	–
Khareek, *Celtis australis* L.	12	–	–

vest of many highly valued plant species[3]. Planting of these threatened and most preferred species of the local people is an important task for maintaining the ecosystem and environmental conservation.

Local preferences of other ethnobotanial species

Pyrus malus was considered the most important species for horticulture by the local people in Chamoli and Pithoragarh. Except *P. malus* and *Prunus persica*, the responses of the local people varied for the remaining horticultural species. Two fodder species, *Quercus leucho-trichophora* and *Quercus semecarpifolia* were considered important by 98–100% of the respondents (Table 3). Although the rest of the fodder species was also considered important, the responses were relatively low. The availability of *Q. leucho-trichophora* and *Q. semecarpifolia* around the year, is one of the reasons for maximum preference for this species, whereas the third most important species, *Grevia oppositifolia*, is a seasonal fodder and thus available only for a limited period of time. There was a sharp difference between Chamoli and Pithoragarh with regard to the preferences over timber-yielding plant species. In Chamoli, *Pinus roxburghii* was preferred by all respondents, whereas *Cupressus torulosa* was preferred in Pithoragarh (Table 3). *P. roxburghii* was a common tree species in the surrounding forest areas of the studied villages of Pauri and Chamoli, whereas *C. torulosa* was a common species in the villages of Pithoragarh. This indicates that the local people mostly prefered species found commonly in their villages for timber.

Except four woody species, the rest of the species selected by the local people varied across the ethnobotanical groups. Among these four species, *Q. leucho-trichophora* and *Q. semecarpifolia* were considered important for timber, medicine and fodder, whereas the other two species, *T. baccata* and *C. deodara* (both gymnosperms), were considered important for timber and medicine. Since these woody species were valued for their useful purposes, to maintain their healthy population is a matter of concern as these species are being over-exploited from their natural habitats. Some concerted efforts need to be taken for their restoration. Many species of timber were used in the construction of houses and furniture, besides other uses. Almost all tree species found in the nearby village areas were rated as preferred species for timber as well as for firewood, because of less choice for timber-yielding species in the study area. This supports the findings of Grundy *et al.*[8] and Lykke[9], whereas it contradicts the findings of Kristensen and Lykke[6].

Local perceptions and management conflicts

The involvement of local communities and their traditional knowledge are mostly ignored in designing policies for environmental management, as evident in the present study area. Contrary to locality-specific people preferences of many valuable ethnobotanical species, which include a number of broadleaved species, industrially valued monoculture plantation of *P. roxburghii* has been emphasized all over the state through Government plantation programmes. Although a variety of plant species have been recommended for plantations in the Forest Management Plans, only a limited number of species are being used in plantations[2]. Among the total 73 species preferred by the local people for medicine, fodder, horticulture and timber, 18% is placed in the Forest Management Plans for plantation. Among the total timber species preferred by the local people, 80% was broadleaved species. In Chamoli district, apart from *P. roxburghii*, the local people have prioritized seven important broadleaved species for plantations, which though placed in the Forest Management Plans are hardly used for plantations. The locality-specific species preferences are important that the local people of Rudraprayag district, adjacent to Chamoli district, are against pine plantations[2].

In spite of the unwillingness of local people, the Forest Department encourages pine plantations because of their ability to resist grazing, rapid growth, commercial values and high survival rate. Unfortunately, the pine forests are prone to fire and every year during summer there is tremendous loss of biodiversity growing under the pine trees[3]. There are provisions in Forest Management Plans to hire daily wage labourers for collection of pine needles in order to check forest fire; however its practicability is limited because of the extensive area under pine forest and inaccessibility of many areas because of difficult mountain terrain. The chances of spreading of the forest fire in the agricultural fields and loss of fodder are the cause of conflicts between villagers and forest managers. For the past few years, attempts are being made by the Forest Department to prepare nurseries of some native rare and endangered medicinal plant species. However, the lack of appropriate agro-technology is one of the major impediments in developing such nurseries of wild, medicinal plant species.

Apart from a few native species, the Forest Department has planted more than 27 exotic species in various parts of the state, namely *Pinus sylvestris*, *P. densiflora*, *Eucalyptus globules*, *Cryptomeria japonica*, and *Acacia* spp. (Table 4). About 30 varieties of hybrids of *Populus* spp., have also been planted by the Forest Department at lower elevations as commercial crop[10]. These exotic and hybrid species are being planted without understanding their effects on the native biodiversity, soil characteristics and water quality. The local people perceive that the Government is spending substantial money on mechanical fencing, and this could be avoided by adopting social fencing, if the community recognizes grazing and other harmful activities as an offence in the plantation sites and penalizes the offenders[2].

Table 4. Major native and exotic ethnobotanical species proposed for plantation in Uttarakhand according to Forest Management Plans

Native plant species	Purpose of plantation of native species	Exotic plant species
Pinus roxburghii Sarg.	Timber, fuelwood, resin	*Salix alba* L.
P. wallichiana Jacks.	Timber, fuelwood	*Pinus elliottii* Engelm.
Cedrus deodara G. Don	Timber, fuelwood	*P. greggii* Engelm.
Acer cappadocicum Gled.	Fodder, fuelwood	*P. thunbergii* Parl.
Quercus leucho-trichophora A. Camus	Fodder, timber	*P. patula* Schiede & Deppe
Q. floribunda Lind.	Fodder, timber	*P. sylvestris* Baumg.
Q. glauca Thunb.	Fodder, timber	*P. densiflora* Sieb. & Zucc.
Q. semecarpifolia Smith	Fodder, timber	*Cryptomeria japonica* D. Don
Celtis australis L.	Fodder, timber, fuelwood	*Populus yunnanensis* Dode
Ficus auriculata Lour.	Fodder	*Albizzia amara* Boiv.
Bauhinia purpurea L.	Fodder	*A. chinensis* (Osbeck) Comb.
Grevia oppositifolia Buch.-Ham. ex D. Don	Fodder	*A. lucida* Benth.
Lyonia ovalifolia (Wall.) Drude	Fodder	*Acrocarpus fraxinifolius* Wight & Arn.
Salix sp.	Fodder, fuelwood	*Quercus serrata* Sieb. & Zucc.
Carpinus viminia Wall.	Fodder	*Taxodium mucronatum* Tanore
Boehmeria rugulosa Wedd.	Fodder	*Acacia albida* Lindl.
Prunus cerasoides D. Don	Fodder	*A. auriculiformis* A. Cunn.
Terminalia bellirica (Gaertner) Roxb.	Fodder	*A. aneura* F. Muell.
Albizzia sp.	Fodder, timber	*A. confusa* Merr.
Diploknema butyracea (Roxb.) H.J. Lam.	Fodder	*A. saligna* Wendl.
Atropa acuminata Royle	Medicine	*A. seyal* Delile
Dioscorea deltoidea Wall. ex Kunth.	Medicine	*Amorpha fruticosa* L.
Hyoscyamus niger L.	Medicine	*Eucalyptus* sp.
Mentha piperita L.	Medicine	
Lavandula officinalis Chaix ex Villars.	Medicine	
Salvia sclarea L.	Medicine	

Implications for conservation

Variations in the preferences of different ethnobotanical species by the local people of different districts of Uttarakhand support the global view that public opinions remain sharply divided on the natural resources utilization patterns and prospects for sustaining the environmental basis of human well-being[11]. In the present study, little variations were found with regard to the preferences of more common ethnobotanical species. It is argued that the preferences of species may be varied on the basis of the respondent's awareness on the indigenous uses of the species and his/her level of knowledge. Such heterogeneity in indigenous knowledge systems within a given area is important for designing localized sustainable management practices[12].

In developing countries, localized community-based conservation has been projected as the most practical approach for biodiversity conservation[13]. Since developing countries have low technical and financial resources for relying exclusively on a model of centralized regulatory control to protect biodiversity from increasing human populations, the community-based conservation scheme that emphasizes the management of biodiversity by, for and with local communities will succeed only if local communities receive sufficient benefits and participate in the management initiatives[14,15]. It has been established that in some cases, local incentives may be more effective than national policy in sustaining the conservation policies and stopping the over-use of natural resources[16].

The species selected by local people of Uttarakhand were native to their surrounding village areas. Hence plantation of such species in the village forests will be environment-friendly and will also maintain the natural habitat. Studies conducted elsewhere have also indicated that in majority of the cases, the local people prefer to grow native plant species in the surroundings of their residential areas[17]. It is realized that the local people will cooperate with the Government officials in the plantation of such native species. The success of plantation of important native species may be more than the exotic species due to available adaptive environment[18]. However, the plantation will be more fruitful if it is cost-effective and satisfies the various stakeholders. Such man-made groves can be utilized for community education and also in advancing the re-vegetation of degraded lands. User-friendly and self-sustaining restoration is known to provide important ecological and social goods and services upon which human life depends. Cultivation of *Elettaria cardamomum* by the local people in the Sikkim Himalaya under natural forests or *Alnus* cover has made shown that ethnobotanical knowledge if recognized, valued and implemented properly, can help the environment and society in a holistic way[13].

There are many reasons for the failure of afforestation and cultivation schemes of medicinal, fodder, timber-yielding and horticultural plant species, such as lack of proper care of plantation area, frequent forest fire, livestock grazing, improper land selection and ignorance of indigenous knowledge systems. Preferences of the local people should be considered in the beginning of such programmes for making successful stories in holistic environmental conservation. Incorporating indigenous ethnobotanical knowledge and practices in scientific research may open up new avenues and hypothesis for designing research experiments relevant to their management. Moreover, in democratic societies such as India, understanding public concerns on issues of health and livelihood is essential, because public preferences may play a major role in designing and implementing the policy in the context of environmental conservation. The present study is a step ahead for a holistic environment around human settlements and re-vegetation of degraded lands through community involvement in selection of key species and their conservation.

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